

15 p



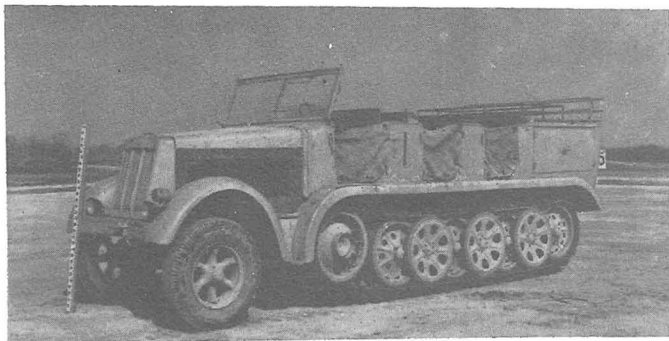
SERIES NINE

M 10 3" Gun Motor Carriage	(US)
88 cm Flak 18	(GE)
Sd Zgkw 8t	(GE)
T 14 Assault Tank	(US)



MILITARY VEHICLE PRINTS

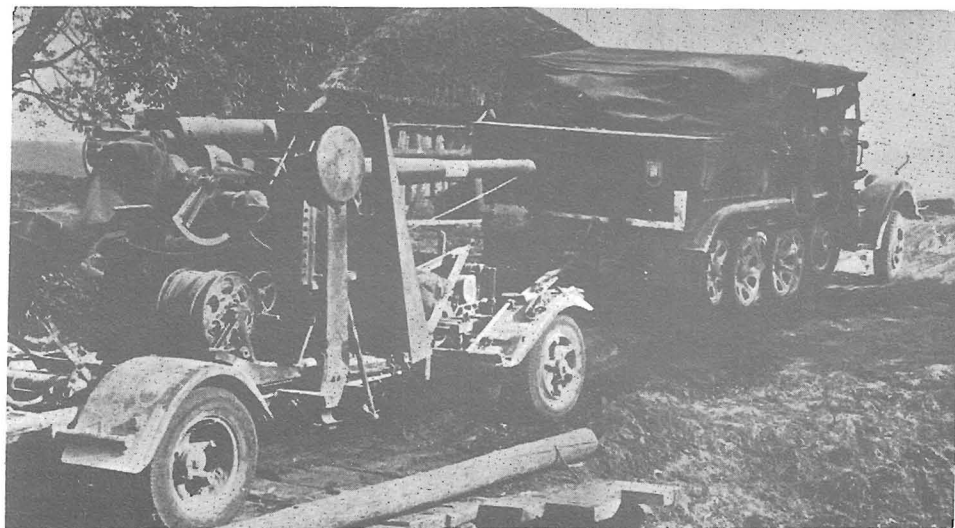
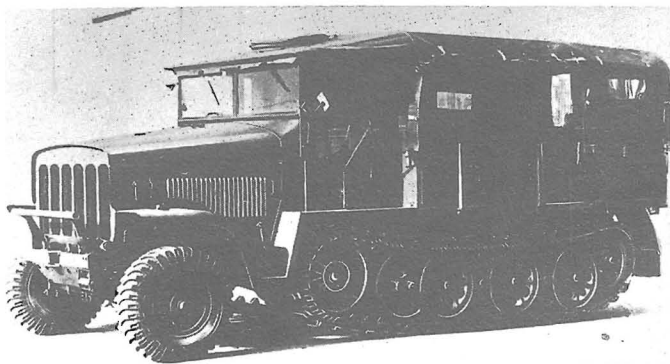
BELLONA
30p



Mittlerer Zugkraftwagen 8t - Sd Kfz 7.
Kraus-Maffei KMm 11.

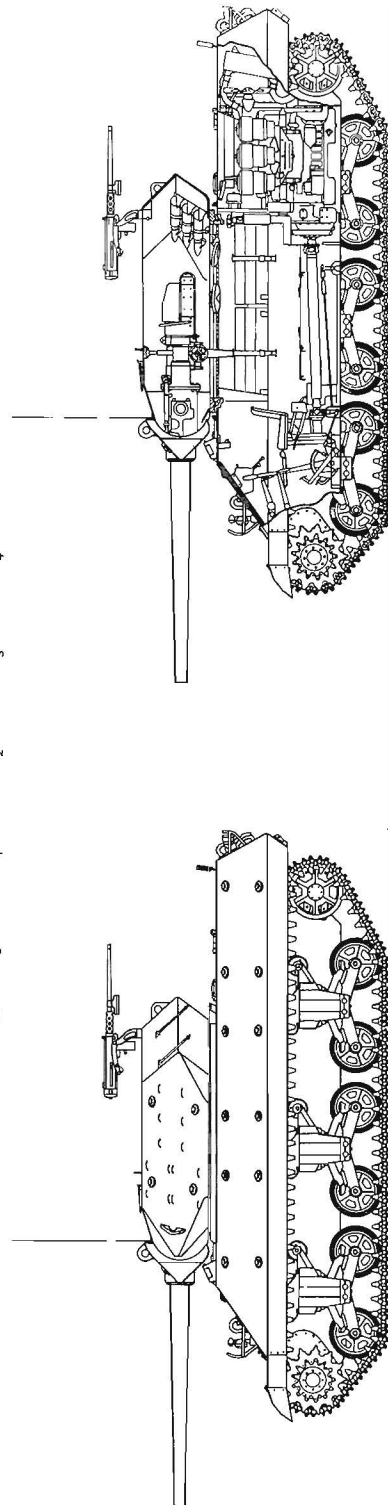
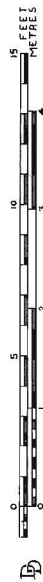
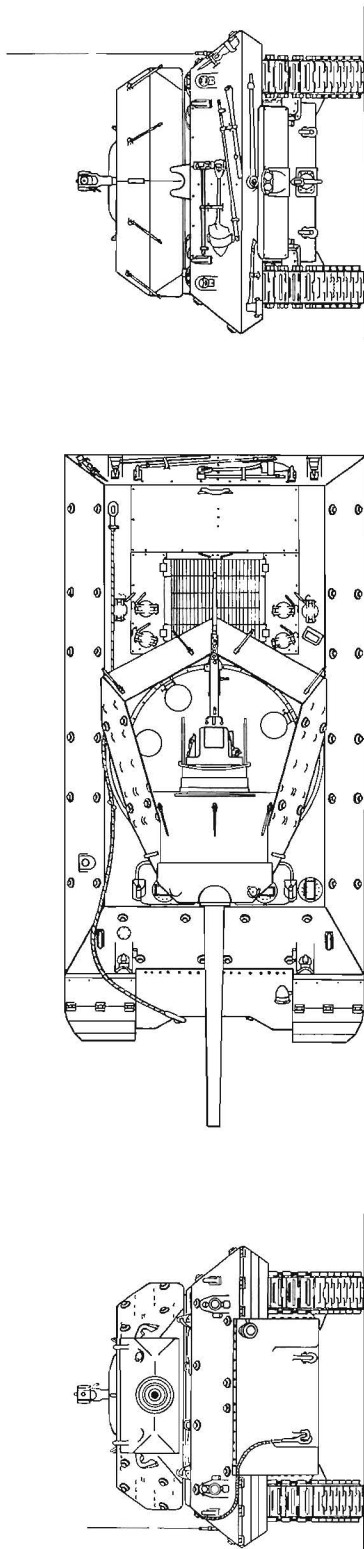
Photograph courtesy of the
U.S. Ordnance Museum.

The British Bedford tractor 'BT'
which was based on the KMm 11
Photograph courtesy of
Vauxhall Motors Ltd.



8.8 cm FLAK 18 on Sonderanhaenger 201 in travelling order. Tractor is one of the
earlier KMm 9 or 10.

3" GUN MOTOR CARRIAGE M.10



Scale 1:76 (4mm. to 1 foot). Drawn by D. P. Dyer

3" GUN MOTOR CARRIAGE M.10 (1952)

After the commencement of World War II the limitations of towed anti-tank guns were soon realised. The various combatants were quick to follow the lead of the Germans in mounting anti-tank guns on wheeled or tracked vehicles to increase their mobility. The United States took a step in this direction by mounting their 37mm A/T gun on a $\frac{3}{4}$ ton 4 wheel drive truck and 75mm guns on half tracks. Both of these vehicles could however only be considered as defensive weapons and it was only with the advent of the 3" GMC M.10 that the American Tank Destroyer Command had any chance of fulfilling its role of offensive action against hostile armoured forces.

The 3" (76.2mm) M.7 gun was the same as that fitted on the M.6 series of heavy tanks and had a similar performance to the 76mm guns which were subsequently fitted to M.4 series Medium Tanks 15 months later. For comparison it was superior in armour piercing performance to both the contemporary British 6pdr and the German 75mm KwK 42 fitted to late PzKpfw IV.

In order to reduce development time the main chassis components of the M4A2 Medium Tank were utilised. The upper hull and turret were completely new designs. This hull and turret with their sloped armour was a vast improvement over many tanks at that period which still tended to have vertical armour and numerous shot traps. Even the Panther was not yet in production when the M.10 was introduced.

Production at the Grand Blanc Tank Arsenal commenced in September 1942 and a total of 4,993 vehicles were produced by December 1943. A considerable number were supplied to Britain where they were called the 'Wolverine'. Many of these were later rearmoured with the British 17pdr making them into a really formidable Tank Destroyer.

The M.10 itself was not a highly effective design due to its weight and size in relationship to the relatively thin armour and size of gun fitted. It did become the most widely used S.P. A/T equipment operated by the Allies in the European Theatre of Operations. Towards the end of World War II M.10s were supplied to the French Army and were used by them until the early 1950s. After the War when the Italian Army was being re-formed M10s were included as part of their Armoured Forces.

The turret as shown on the drawing was as originally fitted. It was soon found necessary to have counterweights added to the rear of the turret which altered the appearance to a certain extent. Late production vehicles had a slightly altered turret and a different shape of counterweight.

Whilst various sources state that the M.10A1 was a successor or an improvement on the M.10 this is not the case. Both vehicles were similar in every respect other than the engine which necessitated a modified top rear hull and were produced concurrently. For further information regarding American Tank Destroyers see Bellona Prints Series 3.

Technical Details of 3" Gun Motor Carriage

Crew: 5

Weight: 66,000 lbs

Performance

Speed: Max Road 32mph (52kmph)

Fording Depth: 48" (122cm)

Trench Crossing: 8' 6" (244cm)

Range: 200 miles (322km)

Grade: 50% (27 degrees)

Obstacle: 24" (61cm)

Dimensions

Length overall: 22' 5" (683cm)

Width: 10' 0" (305cm)

Height: Not including m.g. 8' 5" (256cm)

Ground Clearance: 19" (48cm)

Track Width: 16" (40cm)

Mechanical Details

Engine: 2 x 6 Cylinder Liquid Cooled

Diesel General Motors 6046D

375 HP at 2,900 rpm

Gearbox: Synchromesh 5F-1R

Steering: Controlled Differential

Suspension: Vertical Volute Spring-three bogies of two wheels each side.

Armament

1 x 3" gun M7 in mount M5 Calibre Length 53 in manually operated turret

1 x .50 cal M2 Heavy Barrel m.g. A/A

1 x .45 cal submachine gun

4 x .30 cal carbines

1 x .30 cal rifle

Ammunition Stowage

40 rounds 3"

400 rounds .50 cal, 690 rounds .45 cal

240 rounds .30 cal carbine

60 rounds .30 cal rifle

8 Thermite & 8 Smoke Grenades

ArmourFront Hull $1\frac{1}{2}$ " at 54° (38mm)Hull Sides $\frac{3}{4}$ " at 30° (19mm)Hull Rear $\frac{1}{2}$ " at 30° & 10° (13mm)Hull Top $\frac{3}{4}$ " & $3/8$ " Horiz (19mm & 9mm)Turret Front $2\frac{1}{4}$ " (57mm)

Turret Sides and Rear 1" (25mm)

8.8cm FLAK 18 and 36 (L/56.) 1933-1944

In 1916 the first 8.8cm Kw Flak appeared. Two models were produced, one by Krupps of Essen and the other by Rheinmetall-Borsig, these guns were mounted on a four wheeled trailer and towed by a truck. With the treaty of Versailles Krupp was forbidden to produce small calibre guns. However, in 1921 they arranged that their designers work with Bofors in Sweden and in return Bofors were given foreign concessions on the Krupp guns. As a result of this forward looking policy, in 1928 Krupp was able to produce designs for a high velocity 88 millimetre gun with a semi-automatic breech which ejected the cartridge case and recoiled the striker spring after firing each round.

The 8.8cm FLAK 18 entered production in 1933 and was used to good effect during the Spanish Civil War. Following this battle experience much modification was carried out which resulted in the model "8.8cm FLAK 36" appearing in 1937 having a new barrel with interchangeable rifling tube. A new trailer also appeared with simplified methods of raising and lowering the gun carriage for action. This was known as the "Sonderanheanger 201". In 1937 the FLAK 18 was improved and modified so that it, like the FLAK 36, could be fired at ground targets without having to lower the gun from the trailer. From 1940 numerous guns were equipped with large shields to protect the crew while engaging ground targets. Later models were mounted on the improved "Sonderanheanger 202" with double wheels at both front and rear. Finally the FLAK-37 appeared, the difference being a new gun laying system only used for anti-aircraft purposes.

By the end of 1944 there were over 10,000 of these guns in service. A few were mounted on the 18 ton ZgKw (Sd Kfz 9) and an experimental mounting of a FLAK 37 was made on a special fully tracked chassis, but no further attempts were made to mobilize this series. The example drawn is a FLAK 18 on the "Sonderanheanger 201". This type saw extensive service in the early years of the war in the Desert and Russia. The gun is lowered by unwinding the winches on the front and rear axle assemblies thus tilting these assemblies until the gun carriage rested on the ground whence they could be unhooked and removed to allow access to the gun. All arms of the cruciform were equipped with jacks at the ends with which the gun was leveled and with steel arrows which were hammered into the ground, through the arms, to ensure stability. Trailer brakes are connected to those of the tractor, but manual control is also available from the rear assembly seat. Front wheels of the trailer are connected to the towbar and through it are steerable, springing at the front is by transverse semi-elliptic leaf and the rear rigid axle is sprung by semielliptic springs on each side of the assembly. In order to show details the shield is not shown on the gun in its firing position, and the plan view shows the barrel traversed 45 degrees to the left.

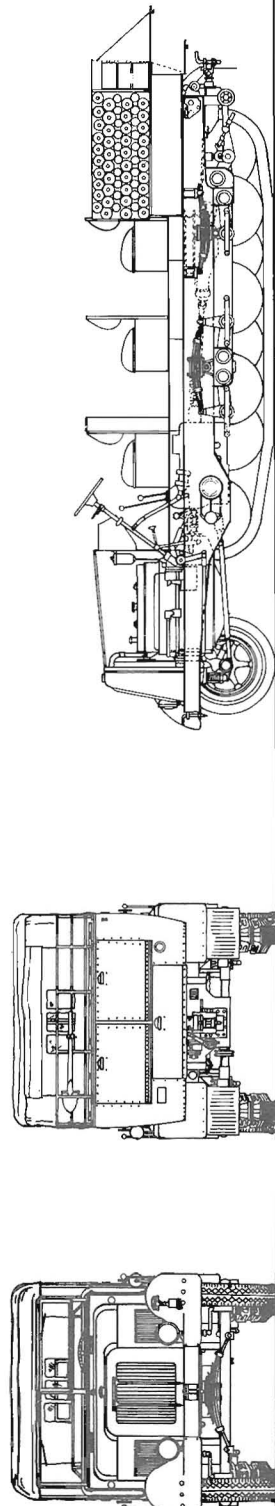
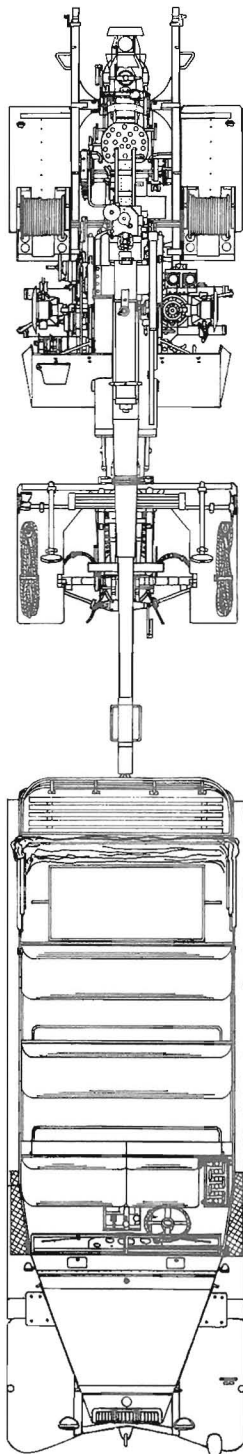
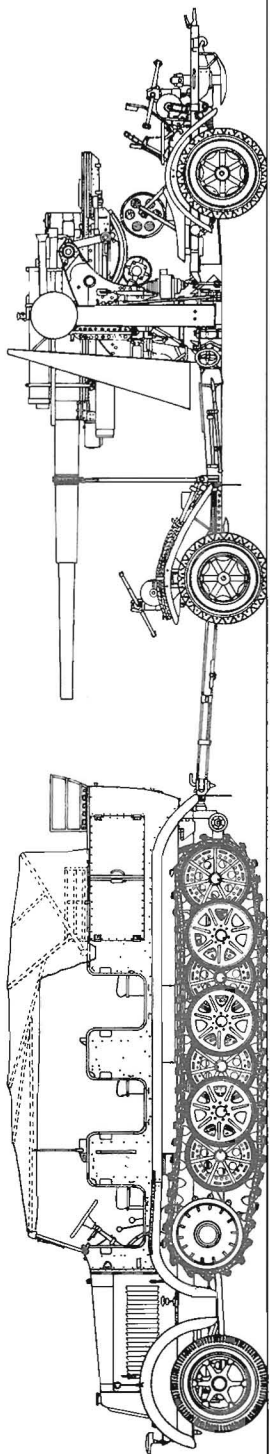
Grateful thanks are tendered to A. L. Sohns without whose research the drawing of the FLAK 18 could not have been included in this series.

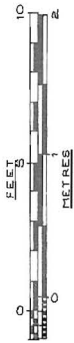
Technical Details for FLAK 18

Crew: 11
 Weight in action: 5 tons (5.3)
 Weight in travelling order: 7 tons (7.5)
 Range horizontal: 16,200 yards (14,680 metres)
 Vertical: 35,100 feet (10,600 metres)
 Traverse: 360 degrees
 Elevation: plus 85, minus 3 degrees
 Rate of Fire: 15/20 rounds a minute
 Muzzle Velocity: RE. 2,690 feet/sec. (820 metres/sec.)
 AP. 2,620 (795)
 Weight of project: HE 20 lbs (9 Kp)
 AP 21 lbs (9.5)
 Smoke: 21 lbs (9.5)

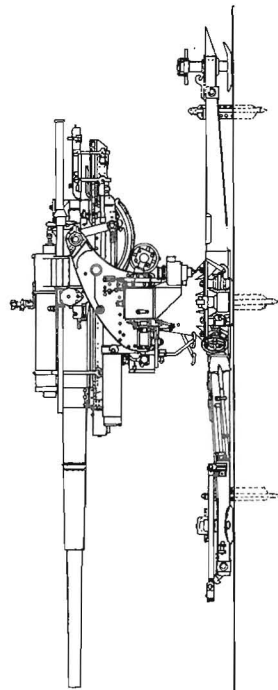
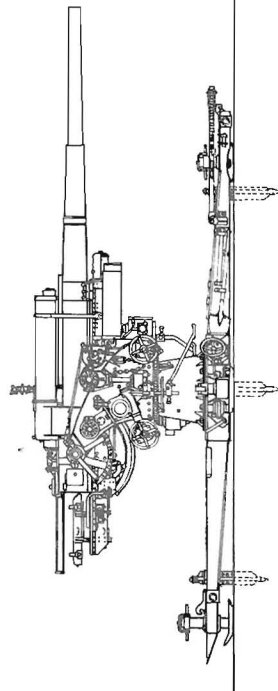
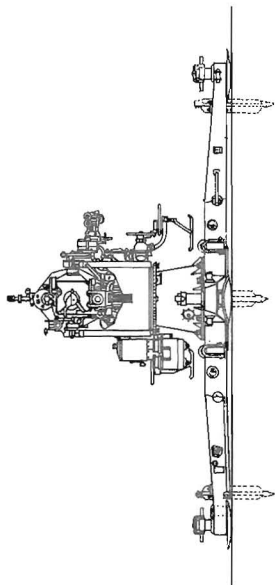
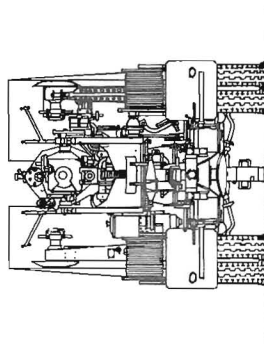
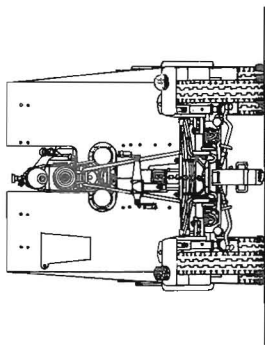
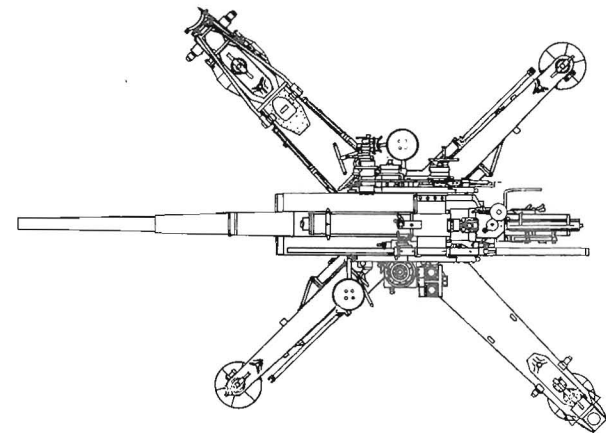


8.8cm FLAK 36 on Sonderanheanger 202, being used against ground targets.





JUNE 14 1966



ZgKw 8t, 8.8cm FLAK 18
Scale 1:76 (4mm to 1 foot) Drawn by H. L. Doyle.

Mittlerer Zugkraftwagen 8t - Sd Kfz 7. 1934-1944.Historical research by W. J. Spielberger.

The Company of Krauss-Maffei A.G. in Munich was responsible for the development of the 8 ton Semitrack. As early as 1928 this Company was making tests to equip their "MS" fourwheel tractor with tracks for the rear wheels. However, it was not until 1934 that the first vehicle, following the usual halftrack design features, appeared. This was the "KMm 8", and 11 ton vehicle with a towing capacity of 8 tons. It was powered by the Maybach 6 cylinder HL 52 petrol engine of 130 bhp. Two other Companies, Daimler Benz and Buessing - NAG, both in Berlin shared in the production of this vehicle under their designation of "DBm 8" and "BNm 8" respectively.

In 1935 an improved model the "KMm 9" appeared, powered by the HL 57 engine and with a crew of 11 men. This was only built by Krauss-Maffei. Starting in 1937 an externally similar was produced, now using the HL 62 engine which developed 140 bhp designated "KMm 10". The same vehicle was also produced by Borgward's Hansa-Lloyd-Goliath Werke at Bremen, where 222 of their "HLM 10's" were manufactured. The official Army designation for these tractors was "Mittlerer Zugkraftwagen 8t (S Kfz 7).

The final version appeared in 1938 and was given the designation "KMm 11" from Krauss-Maffei and "HLM 11" from Borgward. Later during the war years this model was also produced by the Austrian Saurean-Werke in Vienna. On this vehicle the length of track on the ground was extended by the fitting of an additional pair of bogies. These vehicles were in production until the end of 1944 and served in all campaigns. One is represented in the drawing where most features are apparent. However, the major recognition feature of all of the 8t series is the front wheels. These are spoked and the tyres on rims are changed rather than the whole wheel. ZgKm 8t served with artillery units towing the 10 cm s.K. 18 and 15 cm s.F. H. 18 which both weighed about 6.4 tons when being towed. With the Luftwaffe anti-aircraft units they towed the 8.8 cm FLAK 18, 36, 37 or 41. For ground use some vehicles were equipped with armoured or partially armoured cabs.

This vehicle was also used as a self-propelled mount for the quadrupled 2cm FLAK Vierling 38 (Sd Kfz 7/1) with a crew of 10 this had a total fighting weight of 11540 Kp. The "Selbstfahrlafette (Sd Kfz 7/2") was equipped with a 3.7 cm FLAK 36, and had a crew of 7 and a weight of 11050 Kp. Some of these vehicles also had their cabs specially armoured. In addition existing within the Flak units was the so-called "Flak-Messtrupwagen (Sd Kfz 7/6") with a crew of 13. A few of these were also used as a "guidance Centre" for V2 rockets.

Starting in 1940 Krauss-Maffei developed the HK 900 series and in 1941 produced prototypes of the "HK 901" and "904", which were to replace both the ZgKw 5t and 8t. Of 34 units ordered for delivery in 1941 only 30 were delivered and amongst these were 15 of the "HK 905" which had OLVAR automatic transmissions and "Einheits" torsion bar suspensions. In all of the HK 900 series the engine was supposed to be the Maybach HL 66 developing 180 bhp. The top road speed of a "HK 904" was 48 mph. However, despite the improvements none of this series ever entered production.

The British Army were so impressed with the performance of the ZgKw 8t in action and in tests carried out on vehicles captured in Libya that it was decided to develop a similar vehicle. Vauxhall Motors Ltd. of Luton were given the task and in a little over a year had prototype "BT's" (Bedford Tractors) running. No suitably powered engine was available so it was decided to couple two standard Bedford 3.5 litre lorry engines together, thus saving time and standardizing on spares. The "BT" had a road speed of 25 mph when towing a full load and it could climb a 30 degree gradient on its own and ford up to 6'-0" water. Arrangements for full scale production were well advanced when the war in Europe ended and Vauxhall were asked to discontinue the project. Photographic evidence also suggests that the Italian Fiat Works produced a vehicle based on the ZgKw 8t.

Technical DetailsMittlerer Zugkraftwagen 8t (SdKfz 7) - KMm 11.

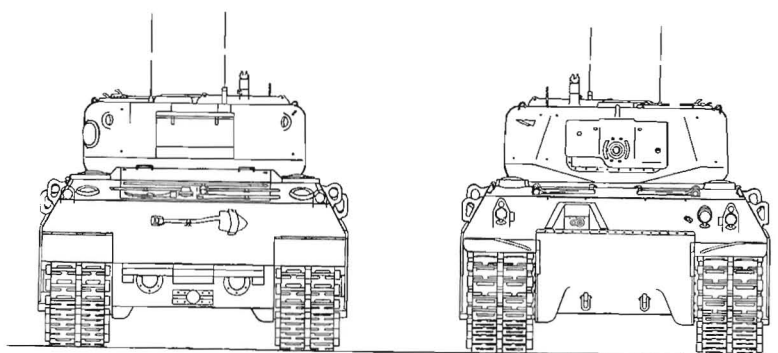
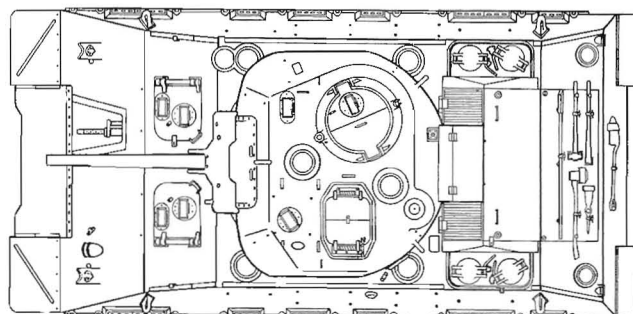
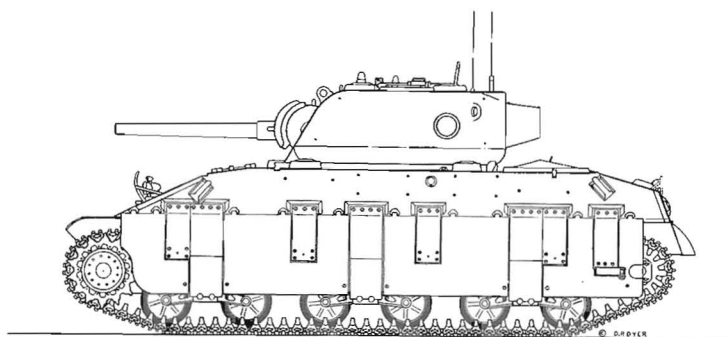
Crew: 12
Weight: laden: 11.4 tons (11,55)
unladen: 9.6 tons (9,75)
Normal trailed load: 8 tons
Performance
Speed, Max. road: 31 mph (50 Km/h)
Max. Gradient: 24 degrees, with full load inc. trailer: 12 degrees.
Fording: 2' 1 1/2" (65cm)
Trench: 5' 11" (180 cm)
Turning Circle: 52' 6" (16 metres)
Range: 185/62 miles (300/100 Km)
Fuel capacity: Internal: 47 gals. later 46 (213, later 203 litres)

Mechanical Details

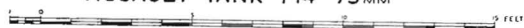
Engine: 1 x Maybach HL 62 TUK, 6 cyl
inline OHV watercooled petrol developing 140 bhp at 2600 rpm.
Gearbox: ZF-55. 4 x forward, 1 x reverse
Auxiliary box with two ratios giving overall 8 x forward, 2 x reverse
Suspension: Front Axle: Transverse semi-elliptic leaf
Bogies: leaf, one semi-elliptic and quarter elliptic each side
Idler sprocket: Torsion bar
Ground pressure: 6.4 lbs/sq. ins (2.24 Kg/sq. cm)
Steering: Normal, Front wheels. Tight circles front wheels and track brakes
Winch: pull capacity: 3.45 tons.

Dimensions

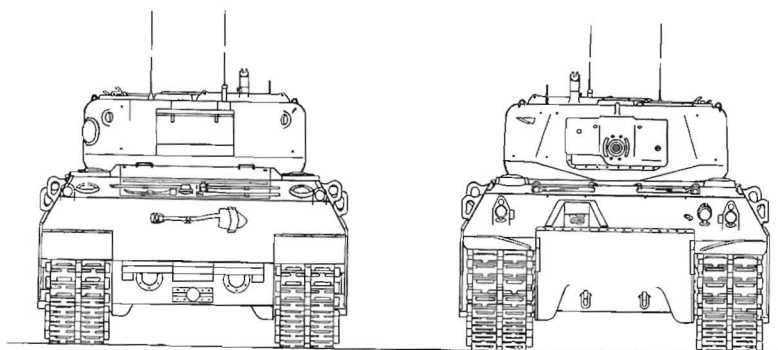
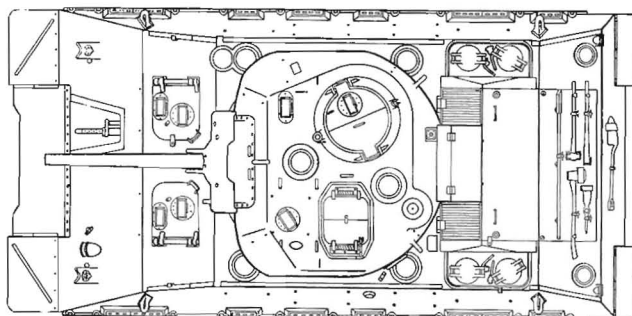
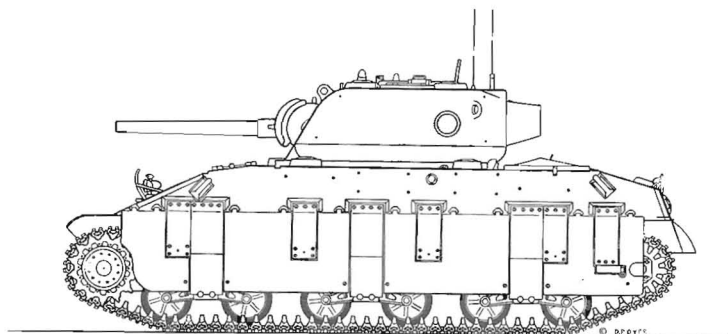
Length: 20' 3" (685 cm)
Width: 7' 10 1/2" (240)
Height: 8' 7" (262)
Ground clearance: 1' 3 1/2" (40)
Track centres: 5' 11" (180)
Track on ground: 7' 4" (223.5)
Track width: 14" (36)
Number of Links: 54
Wheel track: 6' 7" (200)
Tyre size: 38.5 x 8 (975 x 20 Extra)



ASSAULT TANK T14 75 MM



Scale 1:76 (4mm. to 1 foot). Drawn by D. P. Dyer



ASSAULT TANK T14 75MM



Scale 1:76 (4mm. to 1 foot). Drawn by D.P. Dyer

Assault Tank T. 14 (1943)

In order to satisfy British requirements for an Infantry tank, the Americans designed what they termed an Assault tank which was given the experimental designation T. 14. Production was to be simplified by the use of standard components of the M. 4 series of Medium tanks wherever possible. In fact the resulting vehicles ended up looking completely different. The only items utilised eventually were the transmission and power train (other than the final drive) of the M. 4A3. The engine itself was very similar, but of a slightly higher rating.

In view of the weight of armour carried, wide tracks were required, and these, together with the suspension bogies (which were of the early horizontal volute spring type) were identical with those fitted to the M. 6 series of Heavy tanks.

From the external appearance of the hull lessons regarding the advantages of sloped armour had been well learnt. The front glacis plate only being marred by the bow m. g. position. This position was originally conceived for a .50 cal m. g. with an adaptor fitted so that a .30 cal m. g. could replace it when necessary. Tests showed however that even the butt end of a .30 cal constituted a hazard for the assistant driver on rough terrain, and in view of the recess for it forming a projectile trap it would no doubt have been eliminated had this vehicle ever been put into production.

Trials conducted with the T. 14 showed it to have numerous faults. The main ones were with the suspension and steering. Various tracks were fitted, one having outside guides only, another centre guides only, and finally one with both centre and outside guides. None of these improved the track throwing and bogie wheel damaging tendencies of this vehicle. In view of these factors it was recommended that the entire suspension system be re-designed if development was to be continued.

During the time taken from conception, to the building and testing of the prototypes, views had altered considerably with regard to tank requirements. Priority was reduced, and on receipt of an unfavourable test report the project was dropped altogether.

Although it was originally planned to produce 8,500 of these vehicles only two pilot models were completed by the American Locomotive Company. The first of these was finished on the 1st June 1943, and the second soon afterwards. Both vehicles were only fitted with 75mm guns M. 3 and this has been used as a criticism of the vehicle. But it was envisaged that 76mm or 90mm guns, or 105mm howitzers would be fitted on production models and the turret ring diameter of 69" made this feasible.

Out of the two pilot models the first one remained in America where it was eventually broken up. The second one was sent to Britain for tests early in 1944 and has been preserved. It may be seen at the R.A.C. Tank Museum, Bovington.

Technical Details of Assault Tank T. 14 (1943)

Specification

Crew: 5
Weight: 93,930 lbs (42 long tons
47 short tons, 41 tonnes)

Performance

Speed: Max Road 24mph (39kmph)
Max Gradient: 30 degrees
Fording Depth: 36" (91cm)
Trench Crossing: 9' (274cm)
Min Turning Circle: 65' (19.8 metres)
Range: 100 miles (160 km)

Dimensions

Length overall: 20' 10" (635 cm)
Width: 10' 3" (312 cm)
Height: 8' 8" (264 cm)
Ground Clearance: 1' 3" (38 cm)
Track Width: 25 $\frac{3}{4}$ "

Mechanical Details

Engine: 1 x Ford GAZ V8 Petrol, liquid cooled 470 hp at 2,800 rpm
Gearbox: Synchromesh 5F - 1R
Steering: Controlled Differential
Suspension: Horizontal Volute Spring
12 separate bogies of two wheels each

Turret

360 degree traverse power operated

Armament

1 x 75mm gun M. 3 calibre length 40 in mount M34A1. Elevation minus 10, plus 25 degree stabilised in elevation.
1 x .30 cal m. g. co-axial
1 x .30 cal m. g. in bow mount, Traverse 25 degrees right and left, elevation minus 10, plus 25 degrees
1 x .50 cal m. g. HB M. 2 on turret hatch
360 degrees traverse, elevation minus 14, plus 80 degrees

Ammunition Stowage

90 rounds 75mm
No ammunition stowage provided on pilots for .30 cal m. g.'s whilst firing. No information available regarding stowage of remainder of .30 cal or .50 cal.

Armour

Turret: Cast Homogeneous steel. Hull rolled Homogeneous steel, welded assembly
Hull front 2" at 60 degrees (51 mm)
Hull sides upper 2" at 30 degrees (51mm)
Hull sides lower 2 $\frac{1}{2}$ " vertical plus 1" (25mm)
Hull rear 2" vertical and at 20 (51mm)
Floor 1" and $\frac{3}{4}$ " (25mm/19mm) top 1" (25mm)
Turret Front 3" at 30 plus gunshield(76mm)
Turret Sides and Rear 4" vertical (102mm)
Turret Top 1" (25mm)



M10 in action on Omaha beach. This shows the type of counter-weights as fitted to original type of turrets. Illustration of the M10A1 is to be found in the BELLONA Colour Print Series two

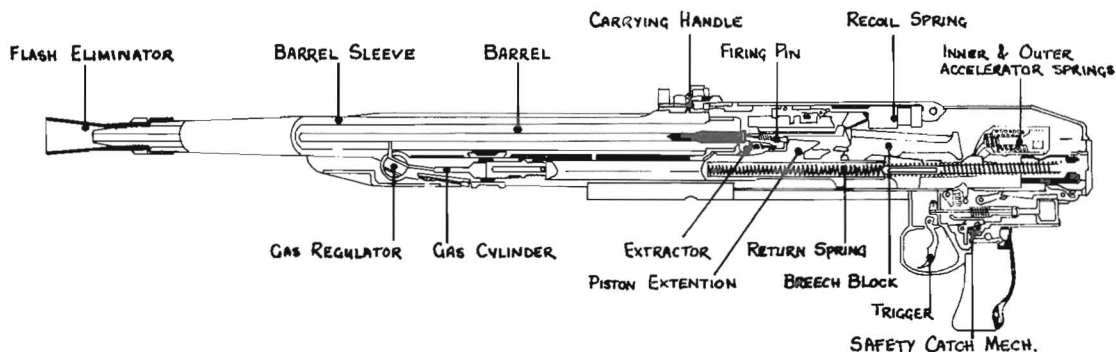


T14 Pilot no 2 supplied to Britain. Side skirts were in sections hinged at top for ease of suspension maintenance (photo Warpics)

A Bellona Book published by Model & Allied Publications Ltd.,
13-35 Bridge Street, Hemel Hempstead, Herts.

THE 7.92mm. BESA MACHINE GUN USED IN A.F.V.S IS AN AIR-COOLED GAS-OPERATED WEAPON WITH BUFFERED ACTION, AMMUNITION BEING SUPPLIED BY A BELT HOLDING 225 RIMLESS CARTRIDGES.

THE MARK OF THE GUN IS STAMPED ON THE LEFT SIDE OF THE GUN BODY.



THE MARK 2 GUN IS AN A.F.V. WEAPON, HAS NO GROUND MOUNTING OR SIGHTS, AND AIMING IS CARRIED OUT BY MEANS OF THE TELESCOPE IN THE GUN MOUNTING.

THE MARK 2* GUN IS A TRANSITIONAL PATTERN BETWEEN THE MK. 2 & MK. 3

THE MARK 3 GUN HAS A FIXED HIGH RATE OF FIRE 750/850 RPM.

THE MARK 3* GUN HAS A FIXED LOW RATE OF FIRE 450/550 RPM.

APPROXIMATE WEIGHT COMPLETE 48lb. (VARIES ACCORDING TO MARK)

APPROX. WEIGHT OF BARREL 15lb. " " " "

OVERALL LENGTH 3' 7 1/2"

LENGTH OF BARREL WITH FLASH ELIMINATOR 2' 5"

AMMUNITION.

CARTRIDGE, S.A. BALL, 7.92mm. - Mk. 1 Z. CHARGE APPROX. 45gr. N.C. A PERCUSSION CAP OF APPROX. 0.5gr. CAP COMPOSITION & A MK. 1 BULLET. - STREAMLINED STEEL ENVELOPE COATED WITH GILDING METAL OR CUPRO-NICKEL & LEAD ANTIMONY CORE

MK. 2 Z. SAME AS ABOVE EXCEPT FOR MK. 2. BULLET WITH FLATTER NOSE & LONGER PARALLEL PORTION WHICH IS ENGRAVED BY RIFLING GIVING GREATER ACCURACY IN WORN BARRELS

CARTRIDGE, S.A. ARMOUR-PIERCING, 7.92mm. W. - CASE & CAP AS ABOVE

MK. 1 Z. THE A.P. BULLET CONSISTS OF A SPECIAL HARD STEEL CORE WITH A LEAD ANTIMONY SLEEVE IN AN ENVELOPE OF STEEL COATED WITH GILDING METAL OR CUPRO-NICKEL

MK. 2 Z. BULLET SLIGHTLY LONGER WITH FLATTER NOSE

CARTRIDGE, S.A. TRACER, 7.92mm. G. - CASE & CAP AS ABOVE

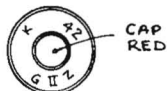
TRACER BULLET - NOT STREAMLINED HAS A STEEL ENVELOPE COATED AS ABOVE, LEAD ANTIMONY TIP, A COPPER TUBE FILLED WITH RED TRACER COMPOSITION & A BRASS WASHER. THE LENGTH OF TRACE IS 900 yds. (APPROX)

CARTRIDGE S.A., INCENDIARY, 7.92mm. B. - ANNULUS OF THE CAP LAQUERED BLUE

CARTRIDGE S.A., DRILL 7.92mm. D. - BULLET NOT STREAMLINED CASE CRIMPED INTO GROOVE ROUND BULLET. N.C. REPLACED BY WOOD DISTANCE PIECE, CASE CHROMIUM PLATED WITH THREE LONGITUDINAL INDENTS IN THE SIDE PAINTED RED.



A.P. MK 2 Z.



TRACER MK 2 Z



DRILL



BALL MK 2 Z